Overhead CLEANER-DRYING Systems FOR SEED COTTON

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OVERHEAD CLEANER-DRYING SYSTEMS FOR SEED COTTON

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INTRODUCTION

Various types of drying apparatus have been built and tested at the United States cotton-ginning laboratories during the past 5 years in an effort to meet the requirements of gins having only one to three stands. The conclusion from these tests is that seed cotton can be dried effectively and economically by introducing heated air either into the suction line entering an overhead air-line cleaner, or into an overhead out-of-the-air cleaner. The air-line cleaner-drier, within certain limitations, has proved satisfactory under test and meets the requirements of the Government process.[2] It and some of the methods of applying hot air to out-of-the-air cleaners are described in this publication.

AIR-LINE CLEANER-DRIERS

Several forms of air-line cleaner-driers were developed in 1936 for use with the Government process; one of these was the type developed and patented by the United States cotton-ginning laboratories, in which hot air was introduced into the suction line of an air-line cleaner concurrently with the seed cotton from the wagon.[3]

[1] The cotton-quality studies involved in the development of cotton-drying processes and apparatus by the Department are part of the program of work of the Cotton Utility and Standards Research Section under the general direction of R. W. Webb, principal cotton technologist, and the immediate supervision of Francis L. Gerdes, cotton technologist, Division of Cotton Marketing, Bureau of Agricultural Economics. Acknowledgment is also made to the following for information furnished for use in the preparation of this bulletin: R. D. Williams; Fairbanks, Morse & Co.; Stacy Co.; and Hardwicke-Etter Co.

[2] This process involves the following features: (1) The damp seed cotton is treated with a continuous current of hot air, at the rate of from 40 to 100 cubic feet of hot air for each pound; (2) the cotton is exposed to the drying process for different periods; (3) the temperature of the drying air should preferably be between 150° and 160° F. for cotton handled during the early part of the ginning season, and as high as 200° for late-season wet cotton.

[3] Bennett, C. A. apparatus for drying seed cotton. U. S. Patent No. 2,078,309. U. S. Patent Office, Off. Gaz. 477: 834, illus. 1937.

All forms of air-line cleaners, such as cross-drum, axial-flow, air-draft, and serpentine types, may be converted into air-line driers in this manner.

The air-line drier uses the Government process for drying damp seed cotton in such a manner as to provide effective and inexpensive drying for ginneries already having an air-line cleaner and not more than four gin stands. It requires only small changes in the existing installation, the purchase of a few accessories such as thermometers, slide valves, and piping, construction of a special inlet fitting for the cleaner, installation of a heater, and adjustment of the speed of the cotton-suction fan to provide enough air for drying and unloading the cotton.

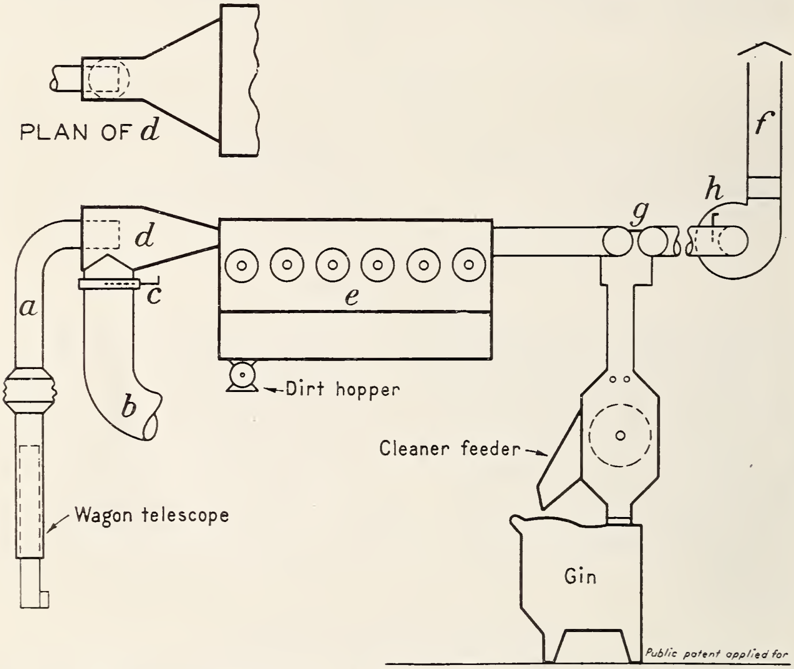

FIGURE 1.—Diagram of air-line drier using split suction and one fan: *a*, 10-inch suction pipe for cotton; *b*, 16-inch suction pipe for hot air; *c*, slide valve for regulating flow of hot air; *d*, special inlet and mixing fitting; *e*, air-line cleaner; *f*, fan discharge of moisture-laden warm air; *g*, pneumatic elevator; and *h*, fan-suction control damper.

The general features of the air-line drier are shown in figure 1, using any source of heat. A split suction on the inlet side of the cleaner brings together the damp cotton and conveying air from one pipe and the heated air from the other pipe. Thus the air-line cleaner becomes the drying chamber, and its moving parts do the fluffing up and conveying that otherwise would be done in a separate drier. The period of exposure to hot air may be somewhat less than in a commercial drier for a large gin.

To operate this form of drier successfully, three conditions must be met: (1) The cotton fan must handle about twice as much air as when no drying is done, or 3,600 and 5,400 cubic feet per minute for the average two- and three-stand ginneries, as compared to 2,000 and 3,000 cubic feet without the drier. (2) The increase in air

volume must not prevent the proper functioning of pneumatic elevators or separators. A commercial installation of the air-line drier at a 4–70 pneumatic gin with single-cylinder axial flow, air-line cleaner operated successfully during 1937 in the Mississippi Delta and handled up to 3½ bales per hour. But difficulties may be encountered on greater outturn, even with mechanical separator systems. (3) A source of heat (pp. 10 to 14) must be available to supply from 400,000 to 600,000 British thermal units [4] per hour.

If steam is used, the best location for the radiator in a one-story gin building is above the cleaner (fig. 13) so it will drain properly to the boiler. In a two-story gin building the radiator and slide valve may be on the ginning floor, as this simplifies installation, makes overhead supports for the heater unnecessary, and puts the hot-air damper where it can be adjusted from the operating floor.

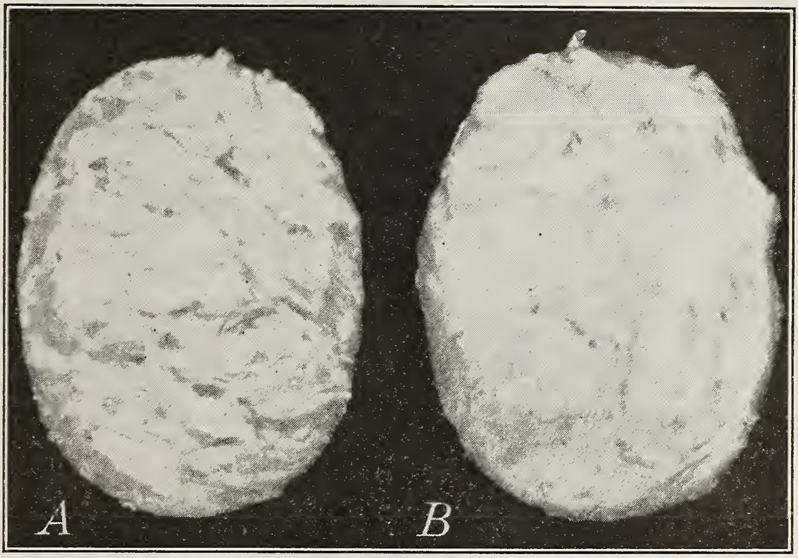

FIGURE 2.—Long-staple cotton ginned (*A*) from damp seed cotton and (*B*) from a portion of the same seed cotton dried by the air-line system.

Moreover, a natural draft results from having the hot-air pipe rise to the cleaner.

One advantage of the air-line drier over more elaborate drying systems is simplicity of installation. Also, cleaning machinery gives better results on dry than on damp cottons.

In tests of six damp cottons of 1$\frac{3}{32}$ inches staple length, the air-line drier gave results that compared favorably with those from the vertical drier, though the latter gave a slightly longer exposure with some additional advantages. For the cottons under test, a drying air temperature of 175° F. within the cleaner was slightly more effective in moisture removal than 150° F., but within this range the most satisfactory temperature depends on the moisture content of the cotton. The grade improvements (fig. 2) obtained with this drier averaged al-

[4] A British thermal unit (B. t. u.) will raise the temperature of 1 pound of air approximately 4° F. Heat requirements for the air-line drier are calculated on the basis of 135 pounds of air per minute per gin stand.

most one-half a grade, or much the same as with the vertical drier. Staple length was not affected. Taking into account the effects on quality and the differences in bale weight, the air-line drier increased the value of the cottons almost $1 per bale. Shorter cotton would have benefited less, possibly about 40 or 50 cents.[5]

The installation cost of this air-line drying system may be held between $500 and $700 if the gin is already equipped with an air-line cleaner and has a suction fan of adequate capacity. Allowing 6 percent interest on a $600 investment and 10 percent for depreciation, the annual fixed cost of this installation would be about $100. With an operating cost of not more than 20 cents per bale, the minimum volume of damp cotton needed to make the drier pay would be 375 bales of short-staple or 150 of long-staple cotton.

In instances where a gin has a pneumatic elevator distributing system and is not equipped with an air-line cleaner, the introduction of hot air in the suction line, with the split-suction arrangement described for the Goverment design of air-line drier, has been found in the laboratory to give fairly good drying effects. Then if a pneumatic gin has steam power, this type of drying system will involve only the split-suction arrangement, heater coils, and steam piping, and will seldom cost more than $350.

OUT-OF-THE-AIR OVERHEAD CLEANER-DRIERS

Out-of-the-air, or gravity, cleaner-driers are effective with large as well as small ginning installations, although their effectiveness may be governed by the quantity of heated air that can be passed through the cleaner without causing operating troubles. Application of the Government process to these driers requires for each gin stand from 900 to 1,200 cubic feet of heated air per minute. Such construction factors as screen area and width and number of cylinders are, therefore, of prime importance.

LOW-TOWER CLEANER-DRIER

An effective drying system may be made by combining a short section of the Government-design vertical drying tower[6] with any horizontal or inclined cylinder cleaner, as shown in figure 3. The low tower, which includes special swinging retarders to prolong the period of exposure, has been satisfactory in recent tests at the United States cotton-ginning laboratories. A nine-floor tower having one bank of retarders, in combination with a cleaner, gives the best results, but a shorter tower may be used where headroom is limited.

Swinging retarders, spaced 2½ inches on centers, provide a simple means of making low drying towers effective. Tests of a vertical drier with nine floors and two banks of retarders compared favorably with the standard 17-floor drying tower having no retarders.

The low-tower drier uses the gin separator if it is a vacuum-wheel dropper type in combination with the cleaner and cotton fan, provided the fan is not used for blowing seed. Whether a new or

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[5] See the following: GERDES, F. L., and BENNETT, C. A. EFFECT OF ARTIFICIALLY DRYING SEED COTTON BEFORE GINNING ON CERTAIN QUALITY ELEMENTS OF THE LINT AND SEED AND ON THE OPERATION OF THE GIN STAND. U. S. Dept. Agr. Bull. 508, 62 pp., illus. 1936.

[6] See the following: BENNETT, C. A., and GERDES, F. L. THE VERTICAL DRIER FOR SEED COTTON. U. S. Dept. Agr., Misc. Pub. 239, 22 pp., illus. 1936.

existing separator is to be used for the drier, it must be of the vacuum-wheel dropper type. It is necessary to drop the damp seed cotton through an air seal because the hot-blast pipe is under pressure and leakage would tend to prevent conveyance of the cotton through the tower.

The hot-blast pipe may pass beneath the separator parallel to the vacuum-wheel shaft in the conventional manner used in cotton-storage systems. This method, herein referred to as parallel blow, is shown in figure 4, *A*. Where inadequate space, belts, or pulleys interfere with use of the parallel-blow method, the cross-blow method developed at the United States cotton-ginning laboratories provides an effective solution. It is shown in figure 4, *B*. The hot air from the heater is jetted beneath the separator at right angles to the vacuum-wheel shaft and sweeps the seed cotton into a converging or

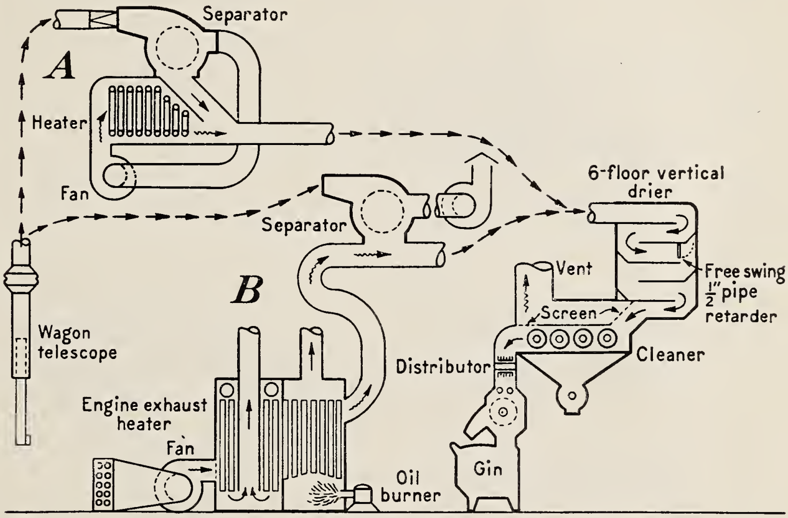

FIGURE 3.—Low-tower cleaner-drier, with alternate arrangements of heater and fans. *A*, One fan, and steam heat coils; *B*, separate drying fan that uses engine cooling water, engine exhaust, and furnace heat.

receiving funnel from which it is carried on to the tower. The nozzle that makes the air jet is constructed to have the same cross-section area as the 16-inch supply pipe, regardless of the width of separator. The receiving funnel opposite the nozzle is usually from 30 to 45 inches long, converging at an angle of 30° to 45° and having an 8-inch mouth running the full length of the separator. The cross-blow method has proved very satisfactory in operation. Its box may be provided with a damper to bypass the drier. This damper is located on the bottom of the box directly beneath the separator. When used, the hot blast must be also bypassed to permit the cotton to fall.

For the one-fan installation (fig. 3, *A*), little if any additional power is needed to operate the drier; very few special items are required; and the drier can be used without heat to fluff and clean the cotton when its moisture content is already satisfactory for good ginning. A Rembert-type fan combined with a drying fan by means

of a special wye may also be used, in lieu of separator and fans, if desired, with very little increase, if any, in power.

The position of the outlet screen and air vent in this system is important and a vent having a cross-sectional area of six or more square feet is recommended. The most advisable position is that employed for the regular tower. It may, however, be at the top of the cleaner, as shown in figure 3, because both methods avoid passing too

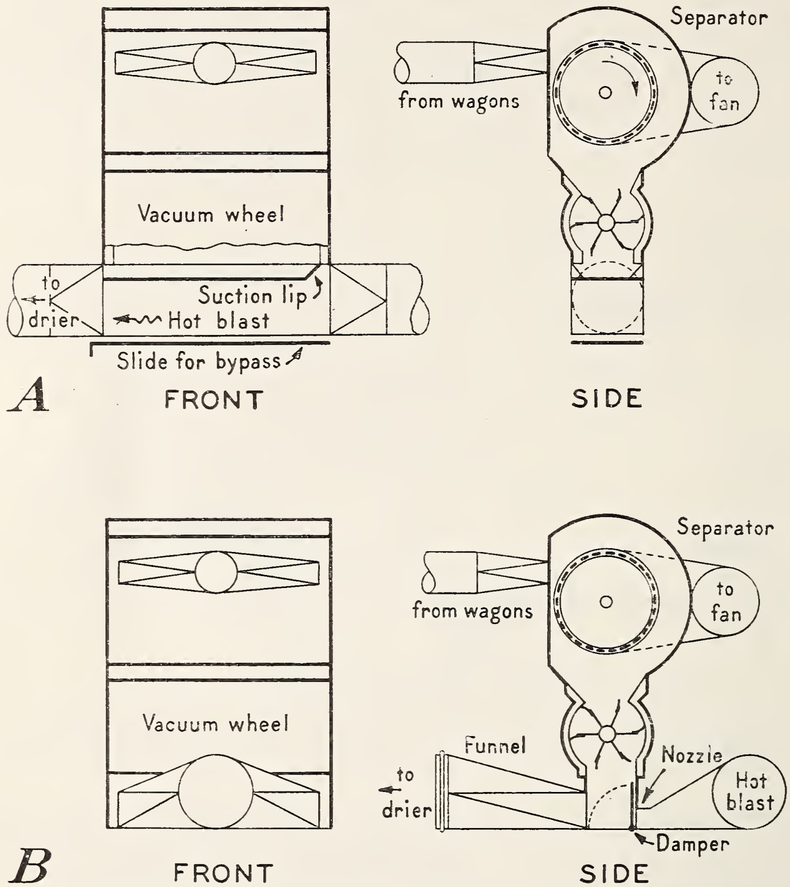

FIGURE 4.—Methods of dropping damp seed cotton from separator into the hot-blast conveying pipe: *A*, Parallel blow; *B*, Government method of cross blow.

much air through the cleaner screens and thus prevent interference with the screening action of the cleaner.

If the discharge from the tower is not placed to deliver downward to the rear cleaning cylinder, because of reversed position of the tower, the screen should be so located that the cotton is deflected to the rear cylinder with a wiping action over the screen to keep it clean. The air vent may then take off where most feasible.

The advantages of this drier are probably greater than those of any other described in this publication, because (1) it is suited to any size of cotton gin, and (2) it is probably cheaper in first cost than any other drier of equal effectiveness. It may be heated by steam,

engine exhaust, or furnace as cheaply as any other form of drier, and has operated very successfully on four-stand outfits. The use of a secondary vent stack at the end of screw distributors keeps the cotton dry during distribution. The low-tower drier may be installed over the distributor in a gin having no cleaner, but such an installation will require complete venting and perhaps a dropper wheel as shown elsewhere.[7]

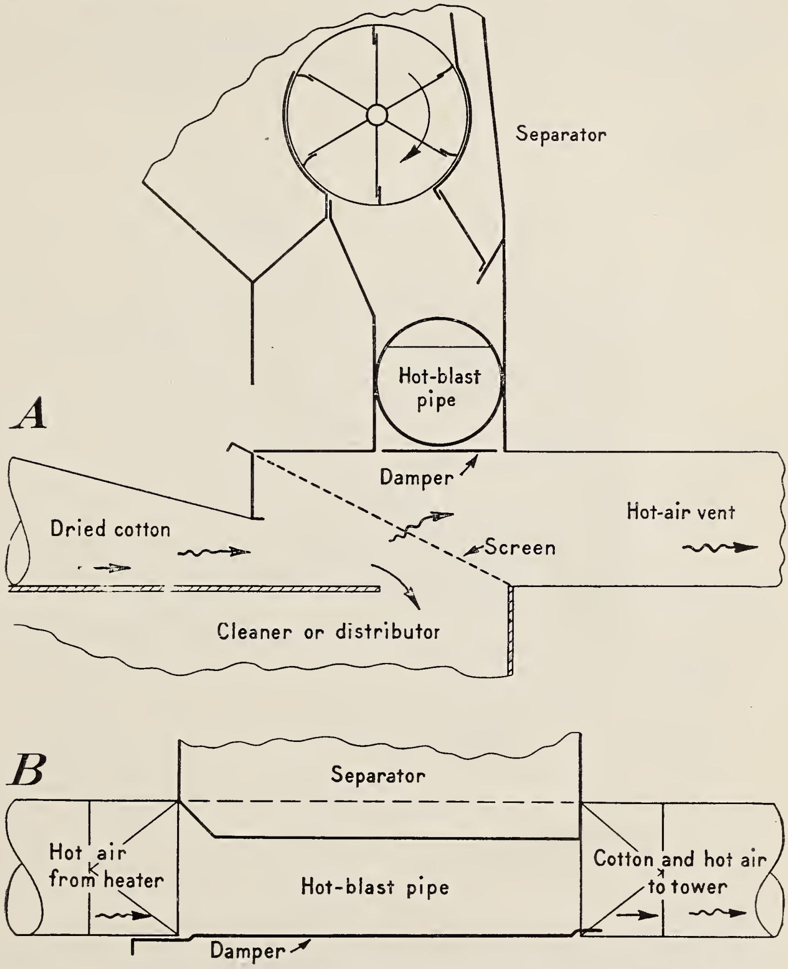

FIGURE 5.—Arrangement of piping and screen when a tower drier is used in gins having a screw distributor: *A*, Section below separator; *B*, hot-blast pipe details.

In gins having screw distributors the dried cotton must be returned to the distributor directly beneath the separator, and a removable screen of ample area is placed in the return pipe to deflect the dried cotton downward into the cleaner or distributor, while permitting the moisture-laden air to be vented to the outside. This arrangement is shown in figure 5.

[7] BENNETT, C. A., and GERDES, F. L. See footnote 5.

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PLAIN CLEANER-DRIER

An inexpensive form of overhead cleaner-drier may be made by omitting the tower shown in figure 3. The quantity of air to be heated depends upon the number of gin stands. As the seed cotton is discharged into the cleaner it must be spread out by means of an adapter so that it will not choke the cylinder or "plaster" the cleaner screen.

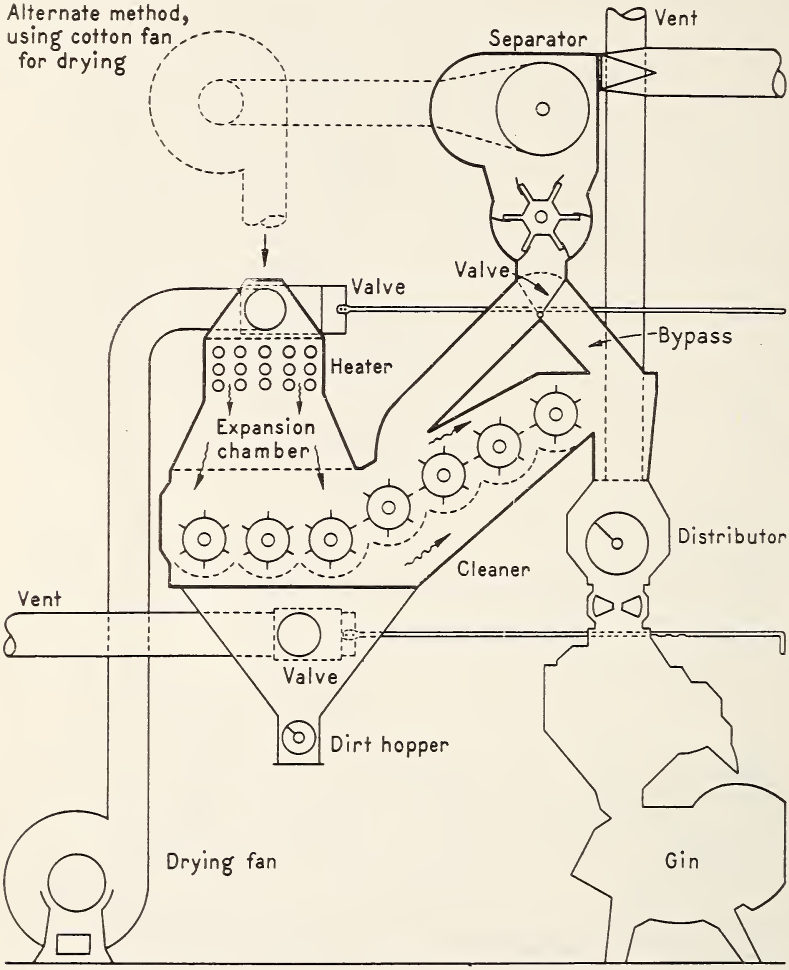

FIGURE 6.—Overhead cleaner-drier with expansion chamber and vent from the distributor.

The vent may take off from the top of the cleaner, or it may be connected to either the cleaner dust box or the distributor, or to both.[8] To avoid back pressure, the area of the vent should exceed that of the supplying pipe. A vertical vent is best, because it creates a natural chimney effect which assists the drying fan appreciably. Steam heat could be used in place of engine-exhaust heat as shown in figure 3, *B*.

[8] Moisture-laden air must be effectively vented through cleaner screens or top to avoid infringement on privately owned patents which preclude discharging hot air into distributor for drying purposes.

The principal advantages of this system lie in its simplicity and adaptability to almost every cotton gin having a cleaner. Its effectiveness, like that of the air-line drier, depends upon the number of cylinders in the cleaner, for more thorough drying is obtained with the larger cleaners that provide longer exposure to the heated air.

One application of this method is shown in figure 6. The cleaner cylinders toss the seed cotton up into the expansion chamber and from there a portion of the hot air travels with the cotton into the distributor and on out through an unrestricted vent, while another portion is vented through the cleaner screens.

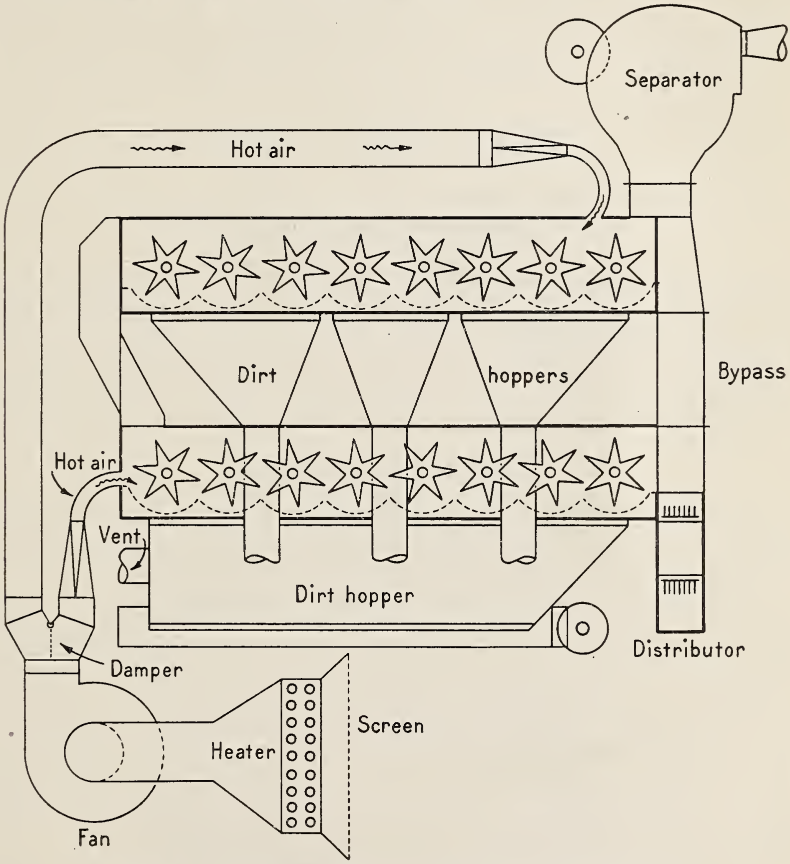

Figure 7.—Two-battery cleaner arranged for artificial drying.

Another single-battery cleaner-drier, involving the application of hot air to a paddle-wheel type of cleaner by means of blowing heated air through a chamber on each side of the cleaner, has been developed by one manufacturer.

MULTIBATTERY CLEANER-DRIER

Another form of overhead cleaner-drier is illustrated in figure 7. The performance of this drier depends upon the number of cylinders and an adequate volume of hot air properly distributed to each bat-

tery. Sizes of branch pipes from the main hot-air supply pipe to the different batteries should be as shown in table 1, so that friction loss per foot will be the same in the branches as in the main pipe. Dampers may be used in each branch pipe to regulate the air flow to each cleaner battery, and vents may take off from below the screens of each one or may be combined into one principal vent as shown in the illustration. With separate vents it is easier to avoid excessive volumes of air in the base section.

TABLE 1.—*Sizes of branch pipes supplying hot air to battery cleaner-driers*

Supply-pipe diameter	Branch-pipe diameter for—	
	2 branches	3 branches
Inches	*Inches*	*Inches*
12	10	8
13	10	9
14	11	9
15	12	10
16	12	11

This system, with double vents, introduces a fresh supply of hot air in the second cleaner section and dries the cotton better than where the moisture-laden air of the first phase is allowed to follow through. In this system, as in those outlined in figures 3 and 6, if the area of the screen is small the high air velocity builds up a mat of cotton on the screen and seriously reduces the drying action.

DRYING-AIR HEATERS

Three sources of heat are generally available for use with the driers described—(1) steam, (2) engine-cooling water and exhaust, and (3) furnace. Combinations of these are often practicable.

For steam heating, at least 7½-boiler horsepower should be provided for each gin stand. A 15-horsepower boiler would supply steam for a 2-stand gin. In conversion of small boilers from coal burning to oil burning, the capacity is increased about 50 percent.

Details of satisfactory iron-pipe heaters are shown in figure 8. They are simple, durable, and effective. All sections are alike, and the pipes aline so they can be cleaned from either the side or the front. After assembly of the units, a casing of 2- by 8-inch dressed lumber should be built around the heater and covered with sheet metal. Adequate clean-out doors should be provided.

The approximate air temperature obtained with different steam pressures and numbers of banks of pipes are given in table 2. For the air-line drier, in which air from the heater is mixed with that from the wagon telescope, 20 banks of heater coil will usually give drying-air temperatures of 145°, 150°, 155°, and 160° F. for the respective steam pressures listed in the table, and 24 banks will give approximately 150°, 155°, 160°, and 165° F.

TABLE 2.—*Average effectiveness of iron-pipe heaters (fig. 7), with air entering at 60° F. and flowing past pipes at 800 feet per minute* [1]

Steam		Temperature of air leaving heater			Steam		Temperature of air leaving heater		
Gage pressure (pounds)	Temperature	16 banks of pipes	20 banks of pipes	24 banks of pipes	Gage pressure (pounds)	Temperature	16 banks of pipes	20 banks of pipes	24 banks of pipes
	°F.	°F.	°F.	°F.		°F.	°F.	°F.	°F.
40	286.7	165	181	194	80	323.9	185	203	218
60	307.3	175	193	206	100	337.9	193	211	227

[1] This table may be used also for the heaters shown in figure 9 by assuming one row of fin tubing to be equal to four banks of iron pipes.

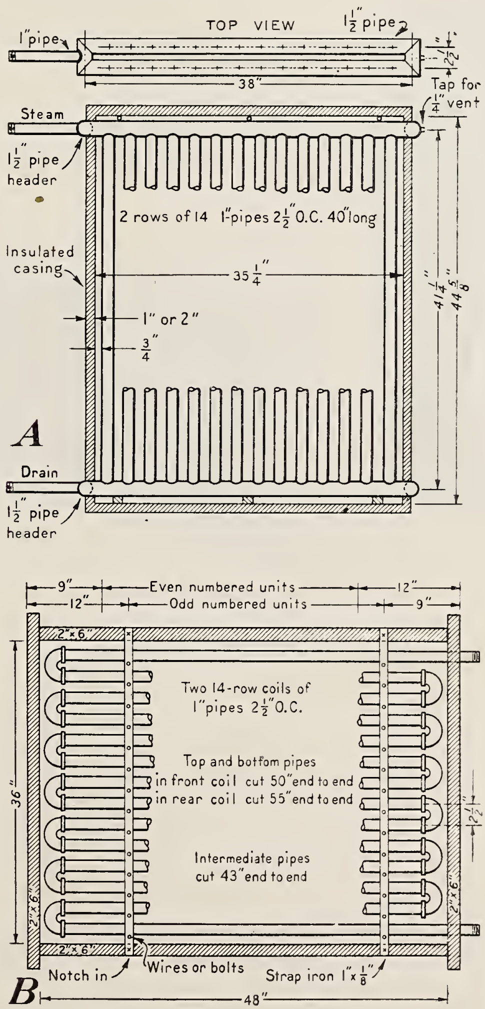

FIGURE 8.—Iron-pipe heaters: *A*, Welded iron-pipe unit; *B*, return-bend iron-pipe unit. The top and sides of the insulated casing are built on the heater after the units are assembled.

Factory-built fin-type heaters (fig. 9) are frequently adaptable to seed-cotton driers. The heating elements of such heaters are usually of copper tubing, ranging from ½ to 1 inch in diameter, upon which helical fins are soldered or brazed to give maximum heat radiation. The tubes may be either horizontal or vertical and as purchased ready for use, are supplied with steam inlet, drain outlet, and sheet-metal jacket or casing. Fin-type heaters weigh much less than iron-pipe heaters of the same capacity, but are harder to keep clean. One bank of fin tubing usually is considered about as effective as four banks of 1-inch iron pipe in heater frames of the same cross section.

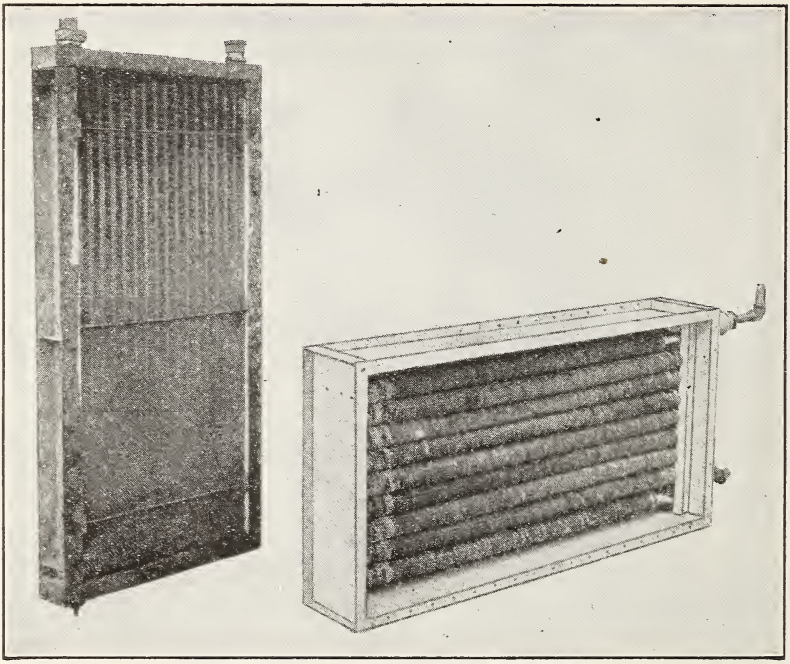

FIGURE 9.—Factory-built fin-type heaters.

Where only one fan is used for both unloading and drying (fig. 3, *A*), only iron-pipe heaters have been satisfactory, because the fin type becomes choked with lint, fly, and trash. Where fresh air is handled through the heaters, the fin type is very satisfactory if there is adequate filtering surface to keep out dust and lint. When water coils are used for heating air, as shown in figure 3, they must be protected by a screen, the same as a steam heater. The heater coils in figures 6 and 7 may be of the fin type if a separate drying fan with screened inlet is used, but must be of iron pipe if one fan performs both the cotton handling and the drying.

Either exhaust or live steam may be used with iron-pipe or fin-type heaters. The steam piping installations are relatively simple, and may be set up as shown in figure 10.

A valuable source of heat for cotton driers is the waste heat in engine exhaust and cooling water. The heat in the cooling water is extracted by drawing or blowing the drying air through a honeycomb

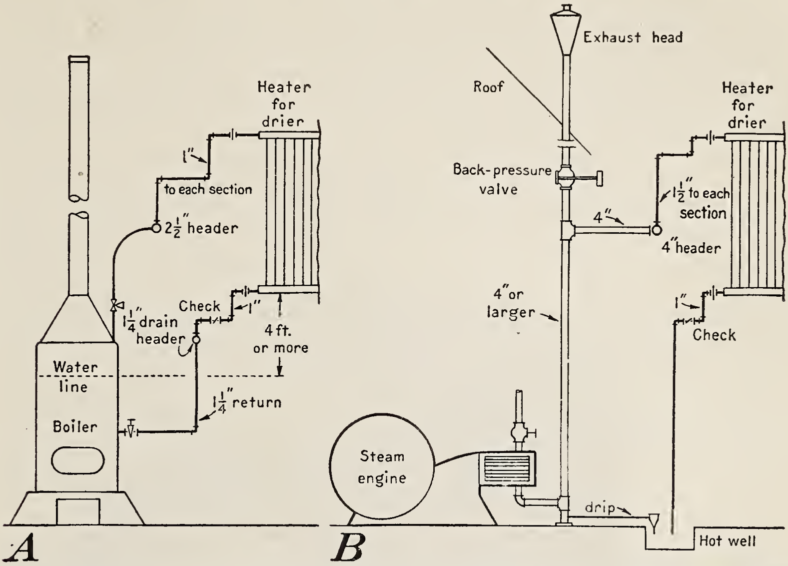

FIGURE 10.—Steam-supply and drain piping for drier heaters for (*A*) high-pressure steam supply, suitable for ginning plants powered by electric motors or Diesel engines; and (*B*) low-pressure steam supply from engine exhaust, suitable for ginning plants powered by steam engines.

or fin-type radiator and then blowing it through an exhaust-heat extractor and an auxiliary furnace (fig. 3). General details of the cooling-water and engine-exhaust heat extractor and furnace are given

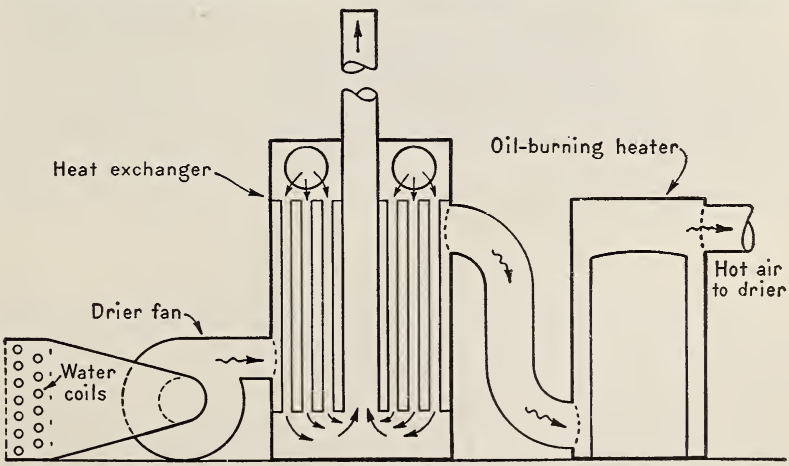

FIGURE 11.—Cooling-water and engine-exhaust heat extractor. Plain arrows show the course of exhaust gas from engine; wavy arrows show air-flow through units.

in figure 11. These units have been combined in recent installations, to conserve space and simplify piping. Except in ginneries having engines of capacity appreciably greater than necessary for operating

the ginning machinery, use of the furnace is necessary to add varying quantities of heat to that obtainable from the cooling water and the exhaust gases. Thermostatic control of the furnace gives uniform drying for a wide range of moisture in seed cotton and in the air. This furnace is particularly suited to welded construction and oil firing. Because there are heat losses from the duct between the engine room and the drier, the burner-control thermostat should be placed in the air duct near the drier to give most satisfactory regulation of drying-air temperature.

The area of heating surface exposed to hot gases in a welded tubular furnace for cotton drying should be about as given in table 3. The exterior of the furnace should be covered with 1½ to 2 inches of diatomaceous earth or air-cell covering to conserve fuel. Handholes are needed to permit inspection and cleaning of tubes. The firebox should be lined with firebrick laid up in very thin fire-clay batter or in high-temperature cement. Flame from the oil burner should not strike the crown sheet or tube surfaces. A lemon-orange flame, without smoke, indicates efficient combustion.

TABLE 3.—*Length of 4-inch tubes in furnace for cotton-drying service* [1]

Gin stands (number)	Overall length of tubes		Gin stands (number)	Overall length of tubes	
	For use with engine-exhaust heat extractor	For use as sole source of heat for drier		For use with engine-exhaust heat extractor	For use as sole source of heat for drier
	Inches	*Inches*		*Inches*	*Inches*
2	30	36	4	54	72
3	36	54	5	72	90

[1] Assuming the use of 40 tubes per unit.

INSULATION

Heat losses from exposed hot surfaces may materially reduce the effectiveness of the drying. Under conditions not uncommon, they may require so much more air as to interfere with satisfactory operation of the cleaners. It is important, therefore, to cover all hot cotton piping and steel casings of cleaners with some kind of air-cell insulating material.

OPERATION OF DRIERS

An overhead cleaner drying system should be run empty for a few minutes to warm it up before receiving damp cotton. By feeling incoming damp cotton and observing ginning results, a ginner soon learns the desirable temperature ranges.

With the air-line drier, adjustment of the wagon suction by means of the valve *c* (fig. 1) will give most effective control of the drying, because it not only regulates the temperature within the drier, but also the drying time. Increasing the wagon suction lowers the drying temperature and speeds up the handling, whereas decreasing the wagon suction raises the drying temperature and slows the flow of cotton.

In the low-tower cleaner-drier, temperature is regulated by adjusting the heater valve or by the automatic furnace thermostat. This drier may be used continuously, with or without heat.

For the plain cleaner-drier and multibattery cleaner-driers (figs. 3, 6, and 7), the operation must be governed carefully according to the condition of the cotton, because some of these driers will not remove so much moisture as the low-tower cleaner-drier or as certain commercial drying units. Necessity will therefore dictate slower feeding at times, to avoid choking the cleaners.

A precaution to be taken with all these driers is to keep the temperature around 160° F. for the early season green and damp cottons, and to increase it as may be required for the later season rain-soaked pickings.

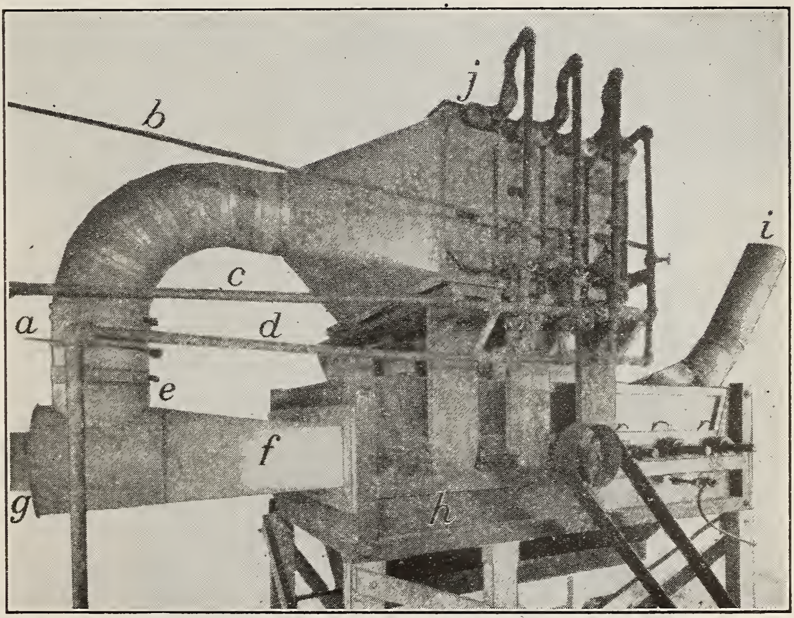

FIGURE 12.—Air-line drier test installation with steam radiators above cleaner: *a*, Slide; *b*, air vent from coils; *c*, steam supply; *d*, steam drain; *e*, hot-air suction; *f*, inlet adapter; *g*, suction to wagon; *h*, air-line cleaner; *i*, discharge pipe; *j*, steam coils.

EXAMPLES OF INSTALLATIONS

The air-line drier test installation at the United States Cotton Ginning Laboratory, Stoneville, Miss., is shown in figure 12. Approximately 3,600 cubic feet of air per minute was handled during the tests and the damper was usually about half open. Cotton was lifted 30 feet from ground level, and after passing through the air-line drier and separator, was discharged to the cleaner test floor.

A commercial installation of the split-suction air-line drier set-up used in connection with an axial-flow air-line cleaner and pneumatic elevators on a 4–70-saw gin outfit is shown in figure 13. The ginner, by increasing the size of the unloading fan, increased the amount of air handled by the air-line cleaner and elevators sufficiently to provide air for unloading and for drying. The split-suction arrange-

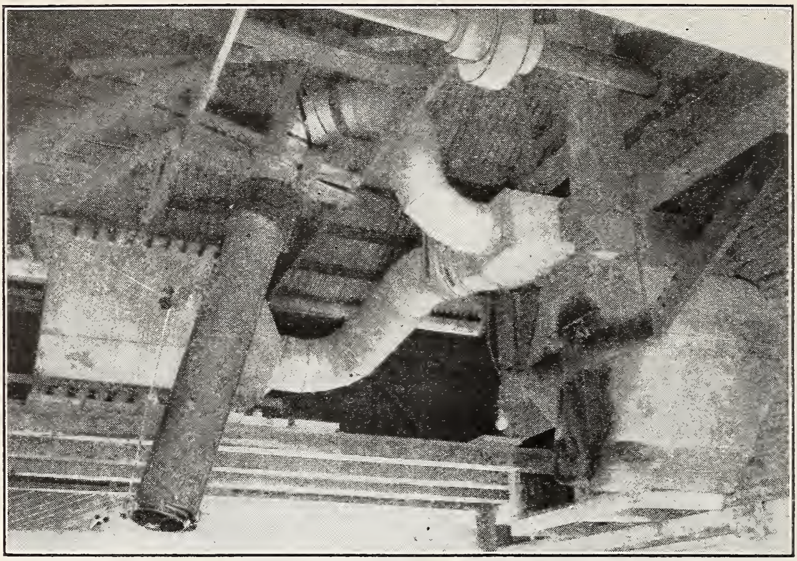

FIGURE 13.—A commercial air-line drier installation at a 4–70-saw pneumatic gin, showing steam heater and end of axial-flow air-line cleaner.

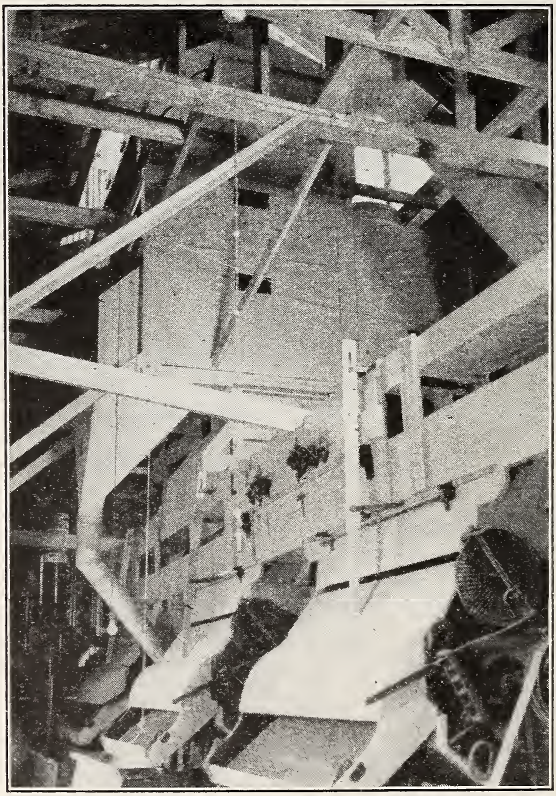

FIGURE 14.—Home-made low-tower overhead cleaner-drier installation.

ment shown provides proper proportioning of the air for these two duties.

Good examples of a low-tower cleaner-drier built by a commercial ginner and used in a two-story gin and of a factory-built unit operating in a one-story gin are shown in figures 14 and 15. Both of these installations, and others of this type, are giving good drying results and are meeting with much favor among ginners.

The installation of an overhead cleaner-drier (fig. 6) is shown in figure 16. Steam-heat coils with expansion chamber are above the

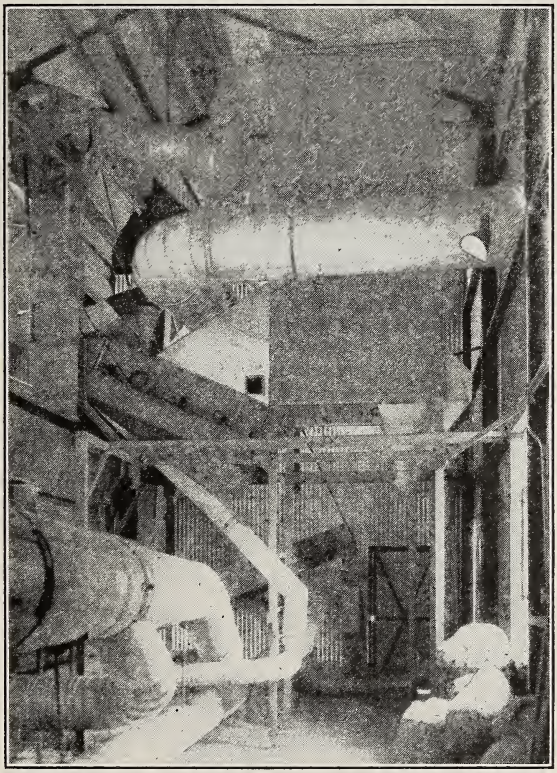

FIGURE 15.—Factory-built type low-tower overhead cleaner-drier installation.

cleaner. It has been operating successfully for a full season. The steam gage on the side of the cotton chute serves as a drying indicator, the gin operator having previously found the relation between drying temperatures and gage pressures.

The use of hot air in a paddle-wheel type of cleaner for drying seed cotton is illustrated in figure 17, in which it may be seen that the heated air is blown into each side of the cleaner.

Figure 18 shows an installation of the multiple cylinder, axial-flow, air-line cleaner-drier recently developed by a gin manufacturer. The steam coils are inside the cleaner.

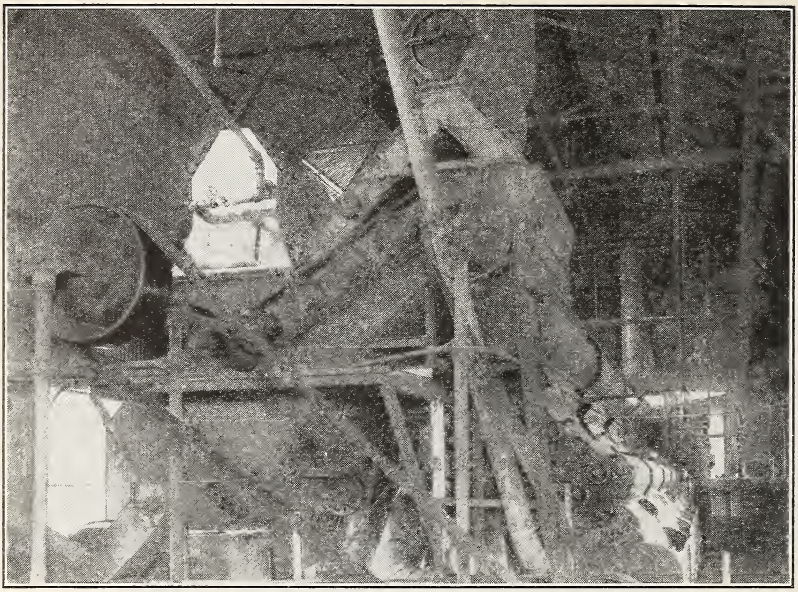

FIGURE 16.—A five-stand cotton gin using hot air in cleaner.

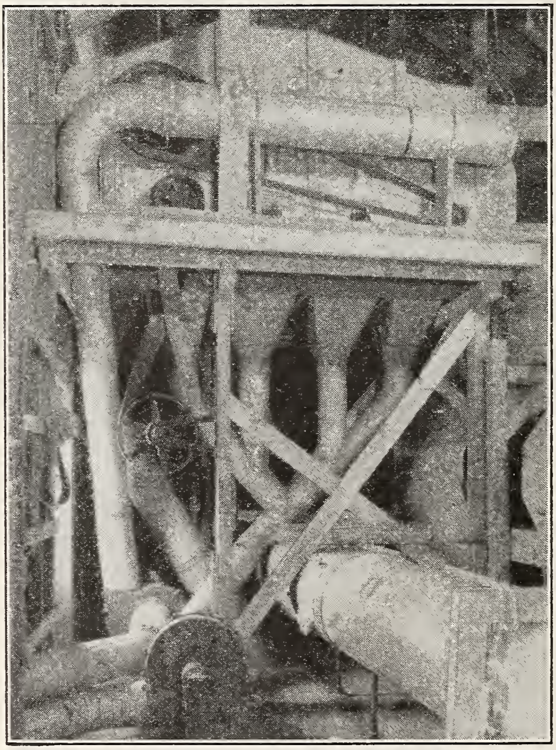

FIGURE 17.—Commercial installation of overhead paddle-wheel type of cleaner equipped with drying attachment.

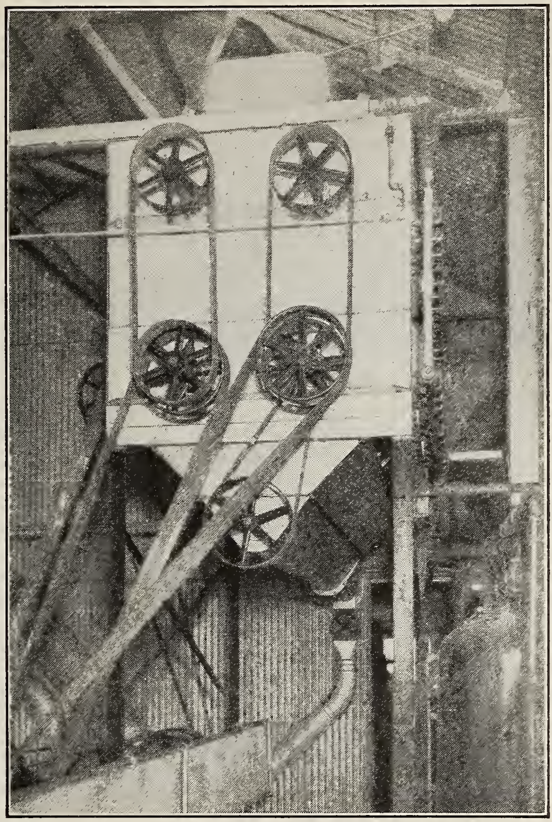

FIGURE 18.—A commercial installation of the multiple-cylinder, axial-flow, air-line cleaner-drier.

USES AND COST OF OVERHEAD CLEANER-DRIER

Several economical applications of the government process cotton driers are possible in small cotton gins. The choice depends upon available equipment already installed and the quantity of cotton to be dried per hour.

Gins having the pneumatic-chute feeding system can use the air-line driers described in this publication, and other airline driers or extractor-feeder driers. Gins with mechanical distributors can use any type of drying systems now available.

A simple air-line drier developed by the United States cotton-ginning laboratories may be installed in ginneries having one to four gin stands, either pneumatic or mechanical, if the gin already has an air-line cleaner, at cost of $500 to $700. The main requirements of air-line driers are increased fan capacity and additional power to operate the fans.

Hot air may be applied to overhead gravity cleaners, if the air volume is limited to give the best effects compatible with normal cleaner operation, at an estimated cost of $600 to $900. These sys-

tems may be further improved by adding the Government-design low-tower drier. This combination of low-tower drier and overhead cleaner is estimated to cost from $900 to $1,100, not including the cost of the cleaner. The low-tower drier may be installed directly over the distributor in gins having no overhead cleaner. Drying systems with both tower and cleaner are suitable for two-story gins where headroom is often limited, and may also be used in one-story gins.

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